

### **REMARKS**

In the Office Action mailed April 12, 2005 (hereinafter, the "Office Action"), Claims 1-30 were pending for consideration. Of these, Claims 1-20 have been elected for further consideration in the present application, and Claims 21-30 have been withdrawn. Of elected Claims 1-20, all have been rejected as allegedly both (1) indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention under 35 U.S.C. 112 second paragraph, and (2) obvious under 35 U.S.C. 103(a). Additionally, the disclosure has been objected to in light of alleged informalities.

By the present amendment, Claim 1 has been amended. No new matter is added by this amendment. Support for this amendment can be found at page 2, line 18 and page 8, lines 24-27 of the filed specification. Further, it should be noted that such amendment has been made without conceding the correctness of the present rejections and without prejudice to Applicant's right to pursue withdrawn or relinquished subject matter in a future patent application, but solely for the purposes of expediting prosecution of the present application. Claims 2-20 have also been amended to reflect the change in the preamble of Claim 1. Accordingly, Claims 1-20 remain pending for consideration in the present application, and reconsideration thereof is respectfully requested.

#### **Disclosure Objection**

The Examiner objected to the disclosure on the grounds that the limitation "mass containing greater than about 95% by volume nanodiamond and greater than about 98% by volume carbon" is confusing because the total volume percent is greater than 100%. Applicant appreciates the concerns

raised by the Examiner. Respectfully, Applicant believes that the Examiner's concerns are resolved in view of the amended claims as discussed during the aforementioned interview. In view of the foregoing, Applicant respectfully submits that the disclosure objection is now moot, and requests that the objection to the disclosure be withdrawn.

**Rejection Under 35 U.S.C. §112 Second Paragraph**

In the Office Action, the Examiner refused claims 1-20 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The Applicant appreciates the concerns raised by the Examiner. Respectfully, Applicant believes that the concerns raised by the Examiner are resolved in view of the amendments made in view of the aforementioned interview. Thus, Claims 1-20 are not indefinite and this rejection should be withdrawn.

**Rejection Under 35 U.S.C. § 103(a)**

Claims 1-20 were pending for consideration in the Office Action. All of these claims were rejected as allegedly obvious under 35 U.S.C. § 103(a) over a number of references and combinations of references. Specifically;

- (a) Claims 1-11 and 15-20 were rejected as allegedly obvious over Cerutti,
- (b) Claims 1-10 and 16-20 were rejected as allegedly obvious over Akashi et al.,
- (c) Claims 11 and 15 were rejected as allegedly obvious over Akashi et al., applied to Claim 1 and in view of Cerutti,
- (d) Claims 1-20 were rejected as allegedly obvious over Phaal et al.,

- (e) Claims 1-20 were rejected as allegedly obvious over Hall et al.,
- (f) Claims 1-20 were rejected as allegedly obvious over Wentorf, Jr. et al.,
- (g) Claims 1-4, 6-11 and 15-20 were rejected as allegedly obvious over Nakai et al.,
- (h) Claims 1-10 and 16-20 were rejected as allegedly obvious over JP 2-30667,
- (i) Claims 11 and 15 were rejected as allegedly obvious over JP 2-30667 applied to Claim 1 and in view of Cerutti,
- (j) Claims 1-4, 6-10 and 16-20 were rejected as allegedly obvious over Sumiya et al.,
- (k) Claims 11 and 15 are rejected as allegedly obvious over Sumiya et al. applied to Claim 1 and in view of Cerutti,
- (l) Claims 1-11 and 15-20 were rejected as allegedly obvious over Yoshida et al., and
- (m) Claims 12-14 were rejected as obvious over either (1) Cerutti as applied to Claim 11, (2) Akashi et al. in view of Cerutti as applied to Claim 11 (3) JP 2-30667 in view of Cerutti as applied to Claim 11, (4) Sumiya et al. in view of Cerutti as applied to Claim 11 above, or (5) Yoshida et al. as applied to Claim 11 above all in view of Phaal et al. and Wentorf, Jr. et al.

Applicant respectfully submits that the rejected claims are patentable over the cited references for the reasons set forth below, and requests that the rejections be withdrawn.

Before discussing the § 103 rejections, it is thought proper to briefly state what is required to sustain such a rejection. The issue under § 103 is whether the PTO has stated a case of *prima facie* obviousness. "The PTO has the burden under § 103 to establish a *prima facie* case of obviousness."

In re Fine, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1598 (Fed. Cir. 1988). To satisfy this burden, the PTO must meet the criteria set out in M.P.E.P § 706.02(j):

. . . three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

With the above background in mind, the rejections under 35 U.S.C. § 103 will be discussed. Applicant contends that the PTO has failed to make a *prima facie* case of obviousness in that: i) it has failed to show motivation to combine the cited references; ii) that the cited references fail to provide a reasonable expectation that the proposed modification will succeed; and iii) that the cited references fail to teach or suggest all of the claim limitations of Applicant's invention.

Referring to the text of the present Office Action, the Examiner asserts that for purposes of the obviousness rejections, he is interpreting carbon to mean diamond. Applicant asserts that the Examiner's interpretation is inaccurate. "Carbon" in the present application means "carbon," not "diamond." Carbon exists in many forms including nanodiamond, diamond, amorphous diamond, graphite and others. Accordingly, since carbon exists in many forms, the interpretation upon which the Examiner has relied in formulating his rejections is inaccurate. Therefore, Applicant submits that the rejections based on this inaccurate interpretation should be withdrawn. Nevertheless, assuming *arguendo* that the Examiner maintains the rejections despite the inaccurate assumption, the Applicant includes the following discussion in response to the rejections.

The Examiner alleges that cited references, either alone or in combination with one another, reasonably teach or suggest the limitations of the rejected claims. According to the Office Action, it would have been obvious to one skilled in the art at the time of the invention to use the prior art references, either alone or in combination with one another, to create a tool by sintering a mass of nanodiamond particles, said mass containing greater than about 95% by volume nanodiamond and greater than about 98% by volume carbon.

### **Present Invention**

In the present case, independent Claim 1 has been amended to include the limitation of the mass “consisting essentially of carbon” and “is substantially free of non-carbon constituents.” Claim 1 thus excludes sintering aids and any non-carbon material in more than trace amounts. Further, this language would exclude any material which is intentionally introduced, even in small amounts, to effect sintering of diamond or to achieve any other stated effect. Thus, only inevitable impurities are intended to be allowed by the amended claims.

### **Discussion**

The following discussion is directed to the issues raised as pertinent to the independent claim of the application. It is recognized that the issues raised by the Examiner pertaining only to dependent claims are addressed by discussions regarding the independent claims, as they are in this case rendered moot if the independent claim(s) are found allowable. The dependent claims are narrower in scope than the independent claims from which they depend, and in the present circumstances are patentable if the independent claim(s) are patentable.

Akashi et al., Phaal et al., Wentorf Jr. et al., Nakai et al., Sumiya et al., and Yoshida et al.

Applicant directs the following discussion to the rejections raised with respect to the above-listed references. None of the above-listed references teach or suggest all of the limitations set forth in Claim 1. Specifically, none of the above listed references teach or suggest a nanodiamond article which does not include a sintering aid or other non-carbon constituent. More specifically, each reference appears to disclose variations on conventional cobalt sintered diamond materials where cobalt or other sintering aid is mixed initially into the green body or is infiltrated therein during high pressure-high temperature processing. Accordingly, the Office has not satisfied the third element required for a prima facie case of obviousness, which is that the prior art references must teach or suggest all of the claim limitations. Accordingly, these prior art references do not render obvious the claims of the present invention. Accordingly, Applicant respectfully submits that the specific rejections identified above as (b), (d), (f), (g), (j) and (l) should be withdrawn.

JP 2-30667

Applicant directs the following discussion to the rejections raised with respect to the JP 2-30667 reference. The JP 2-30667 reference does not teach or suggest all of the limitations set forth in Claim 1. Specifically, the JP 2-30667 reference does not teach or suggest a sintered mass containing greater than about 98% by volume carbon. Accordingly, the Office has not satisfied the third element required for a prima facie case of obviousness, which is that the prior art references must teach or suggest all of the claim limitations. Accordingly, JP 2-30667 does not render obvious

the claims of the present invention. Accordingly, Applicant respectfully submits that the specific rejection identified above as (h) should be withdrawn.

The JP 2-30667 reference is directed to a diamond sintered material wherein the volume percent of diamond in the mass is 95%. However, the JP reference does not teach or suggest a sintered mass greater than about 98% by volume carbon. Since the JP reference does not make any reference to the carbon content of the mass, it should be assumed that the carbon content can only be as high as the diamond content, i.e., 95% by volume. This means that at least 5% by volume consists of inevitable, non-carbon impurities or empty voids. Alternatively, the present invention teaches that about 98% by volume of the sintered mass is carbon. This leaves only 2% by volume of the mass to non-carbon impurities. The Examiner argues that since the reference states the mass comprises 95% by volume diamond, this broadly makes the claimed amount of about 98 volume percent obvious because “about” permits some tolerance, citing *In re Ayers*, 154 F 2d 182, 69 USPQ 109. However, even though “about” permits some tolerance, it does not permit a difference of a full 3%, particularly in this context where a 3% difference in the amount of impurities would sufficiently alter the performance of the diamond tool. Further, this reference fails to teach or suggest the diamond body being free of non-carbon constituents. In view of the foregoing, the present invention is not obvious in light of the JP reference.

#### Cerutti Reference

The Cerutti reference does not teach or suggest all of the limitations set forth in Claim 1. Specifically, the Cerutti reference does not teach or suggest a sintered mass which consists

essentially of carbon and is substantially free of non-carbon materials. Accordingly, the Office has not satisfied the third element required for a prima facie case of obviousness, which is that the prior art references must teach or suggest all of the claim limitations. Accordingly, Cerutti does not render obvious the claims of the present invention. Accordingly, Applicant respectfully submits that the specific rejection identified above as (a) should be withdrawn.

Hall et al. Reference

The Hall et al. reference does not teach or suggest all of the limitations set forth in Claim 1. Specifically, the Hall et al. reference does not teach or suggest sintered nanodiamond which is substantially free of non-carbon constituents. For example, the Hall reference clearly teaches a conventional cobalt sintered PCD material having a copper content designed to form a bondable layer at one edge. Regardless of the method of formation of the PCD, Hall requires that cobalt either be mixed with the diamond powder or infiltrated from an adjacent layer, e.g. a cobalt cemented tungsten carbide. Therefore, Hall fails to teach a diamond mass which does not contain substantial amounts of non-carbon constituents. Accordingly, the Office has not satisfied the third element required for a prima facie case of obviousness, which is that the prior art references must teach or suggest all of the claim limitations. Accordingly, Hall et al. does not render obvious the claims of the present invention. Thus, Applicant respectfully submits that the specific rejection identified above as (e) should be withdrawn.

Akashi et al., applied to claim 1 and in view of Cerutti

Applicant respectfully submits that the Akashi et al. and Cerutti references are not properly

combined to support a § 103 rejection for a number of reasons. First, the Akashi et al. and Cerutti references teach away from the combination claimed in the present application. Cerutti teaches polycrystalline compact tool blanks with flat carbide support/diamond or CBN interfaces wherein the diamond crystals are in the micrometer range. Akashi et al. teaches a diamond compacted composite that can be used as a cutting tool. Each reference teaches or suggests diamond composite materials comprised of diamond particles and diamond crystals in the micrometer range which are conventional cobalt sintered materials, which by design include non-carbon constituents.

In contrast, the present invention teaches nanodiamond tools comprised of sintered nanodiamond particles having substantially no non-carbon constituents. Following the teachings of either Akashi et al. or Cerutti, or Akashi et al. and Cerutti in combination, would not result in a nanodiamond tool, comprising a mass of sintered nanodiamond particles having substantially no non-carbon constituents. In light of the above comments, Applicant respectfully submits there is no suggestion or motivation to modify the Akashi et al. and Cerutti references, or to combine the teachings thereof. As such, the first element of the *prima facie* case necessary to support a § 103 rejection was not established in the Office Action.

Additionally, the references cited by the Examiner fail to teach or suggest each of the elements of the claimed invention. As discussed above, Cerutti teaches diamond particles and diamond crystals in the micrometer range, and Akashi et al. does not make any reference at all to the diamond or particle size of the diamond used in its composite tools. Nothing in the combination of references teaches or suggests a nanodiamond tool, comprising a mass of sintered nanodiamond

particles, being substantially free of non-carbon constituents. The Akashi et al. and Cerutti references thus fail, when combined, to teach the limitations of pending Claims 11 and 15 as applied to Claim 1.

In light of the above comments, Applicant respectfully submits the art cited in the Office Action fails to teach or suggest each of the elements of the claimed invention. As such, the third element of the *prima facie* case necessary to support a § 103 rejection was not established in the Office Action. Accordingly, Applicant respectfully requests that the rejection identified above as (c) be withdrawn.

JP 2-30667 applied to Claim 1 and in view of Cerutti

Applicant respectfully submits that the JP 2-30667 and Cerutti references are not properly combined to support a § 103 rejection for a number of reasons. First, the JP 2-30667 and Cerutti references teach away from the combination claimed in the present application. Cerutti teaches polycrystalline compact tool blanks with flat carbide support/diamond or CBN interfaces wherein the diamond crystals are in the micrometer range. JP 2-30667 teaches a diamond compacted composite that can be used as a cutting tool. Again, each of these references appear to teach conventional cobalt sintered diamond materials which include various non-carbon materials.

Following the teachings of either JP 2-30667 or Cerutti, or JP 2-30667 and Cerutti in combination, would not result in a nanodiamond article which is substantially free of non-carbon constituents. In light of the above comments, Applicant respectfully submits that the cited

references fail to teach or suggest each and every element of pending Claims 11 and 15 as applied to Claim 1.

In light of the above comments, Applicant respectfully submits the art cited in the Office Action fails to teach or suggest each of the elements of the claimed invention. As such, the third element of the *prima facie* case necessary to support a § 103 rejection was not established in the Office Action. Accordingly, Applicant respectfully requests that the rejection identified above as (i) be withdrawn.

Sumiya et al. applied to Claim 1 and in view of Cerutti

Applicant respectfully submits that the Sumiya et al. and Cerutti references are not properly combined to support a § 103 rejection for a number of reasons, and therefore the rejection identified as (k) above should be withdrawn. First, the Sumiya et al. and Cerutti references fail to teach or suggest each of the elements of the claimed invention. As discussed above, Cerutti teaches diamond particles and diamond crystals in the micrometer range which are sintered using a conventional sintering aid such as cobalt. Sumiya et al. teaches a diamond compact that can be used as a cutting tool. Nothing in the combination of references teaches or suggests a mass of sintered nanodiamond particles, having substantially no non-carbon constituents. The Sumiya et al. and Cerutti references thus fail, when combined, to teach the limitation of Claims 11 and 15 as applied to Claim 1.

In light of the above comments, Applicant respectfully submits the art cited in the Office Action fails to teach or suggest each of the elements of the claimed invention. As such, the third element of the *prima facie* case necessary to support a §103 rejection was not established in the

Office Action. Accordingly, Applicant respectfully requests that the rejection identified above as (k) be withdrawn.

(1) Cerutti as applied to claim 11, (2) Akashi et al. in view of Cerutti as applied to claim 11 (3) JP 2-30667 in view of Cerutti as applied to claim 11, (4) Sumiya et al. in view of Cerutti as applied to claim 11 above, or (5) Yoshida et al. as applied to claim 11 above all in view of Phaal et al. and Wentorf, Jr. et al.

Applicant respectfully submits that none of the immediately preceding references are properly combined to support a § 103 rejection for a number of reasons, and therefore the rejection identified above as (m) should be withdrawn. Specifically, as discussed above, none of the cited references teach or suggest sintered nanodiamond articles which are substantially free of non-carbon constituents. In light of the above comments, Applicant respectfully submits the art cited in the Office Action fails to teach or suggest each of the elements of the claimed invention. As such, the third element of the *prima facie* case necessary to support a §103 rejection was not established in the Office Action. Accordingly, Applicant respectfully requests that the rejection identified above as (m) be withdrawn.

**CONCLUSION**

In view of the foregoing, Applicant believes that presently pending Claims 1- 20 present allowable subject matter and allowance is respectfully requested. If any impediment to the allowance of these claims remains after consideration of the above remarks, and such impediment could be resolved during a telephone interview, the Examiner is invited to telephone Mr. Erik Ericksen, or in his absence, the undersigned attorney, at (801) 566-6633, to address such issues as expeditiously as possible.

The Commissioner is hereby authorized to charge any additional fee or to credit any overpayment in connection with this Amendment to Deposit Account No. 20-0100.

Dated this 11<sup>th</sup> day of September, 2005.

Respectfully submitted,

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